



# **THE RISE OF THIRD PARTIES AND THE FALL OF INCUMBENTS DRIVEN BY LARGE-SCALE INTEGRATION OF RENEWABLE ENERGIES – THE GERMAN CASE**

Dr. Marius Buchmann / Jacobs University Bremen  
27<sup>th</sup> September 2017, Paris

# Bremen Energy Research



- Bremen Energy Research is a research group @ Jacobs University Bremen that focuses on the economic analysis of energy policy, especially the energy transition
- Current key topics
  - Network regulation
  - Governance of smart grids
  - Market Design
- Team
  - Prof. Dr. Gert Brunekreeft
  - Christine Brandstädt M.Sc.
  - Dr. Marius Buchmann
  - Dr. Roland Meyer
  - Martin Palovic M.A.

## References

- enera – SINTEG (BMWi)
- Energiewende D-EU (BMWi)
- dena Smart Meter Study
- dena distribution grid study
- Green2Store (BMWi)
- Xgen and the Energy Transition
- Japan: Network pricing
- ConDyNet (BMWi)
- Japan: Unbundling
- China: Pathways Smart Grid
- Austria: Inst. Framework Smart Grid



# BEING AN UTILITY IN GERMANY IS A CHALLENGING TASK & AND IT IS JUST STARTING...



"At innogy we are not afraid of the future. We will shape it."

## Challenge accepted: how big energy companies can become innovative pioneers

Veröffentlicht: 21. Juni 2017 | Vorgestellt in: [Oil & Energy](#)



**Peter Terium** [influencer](#) | [Folgen](#)  
CEO von innogy SE



266



10



57



"There are three ingredients for a successful transformation."

## We're still practising: Reinventing an energy giant

Veröffentlicht: 17. Juli 2017 | Vorgestellt in: [Oil & Energy](#)



**Peter Terium** [influencer](#) | [Folgen](#)  
CEO von innogy SE



221

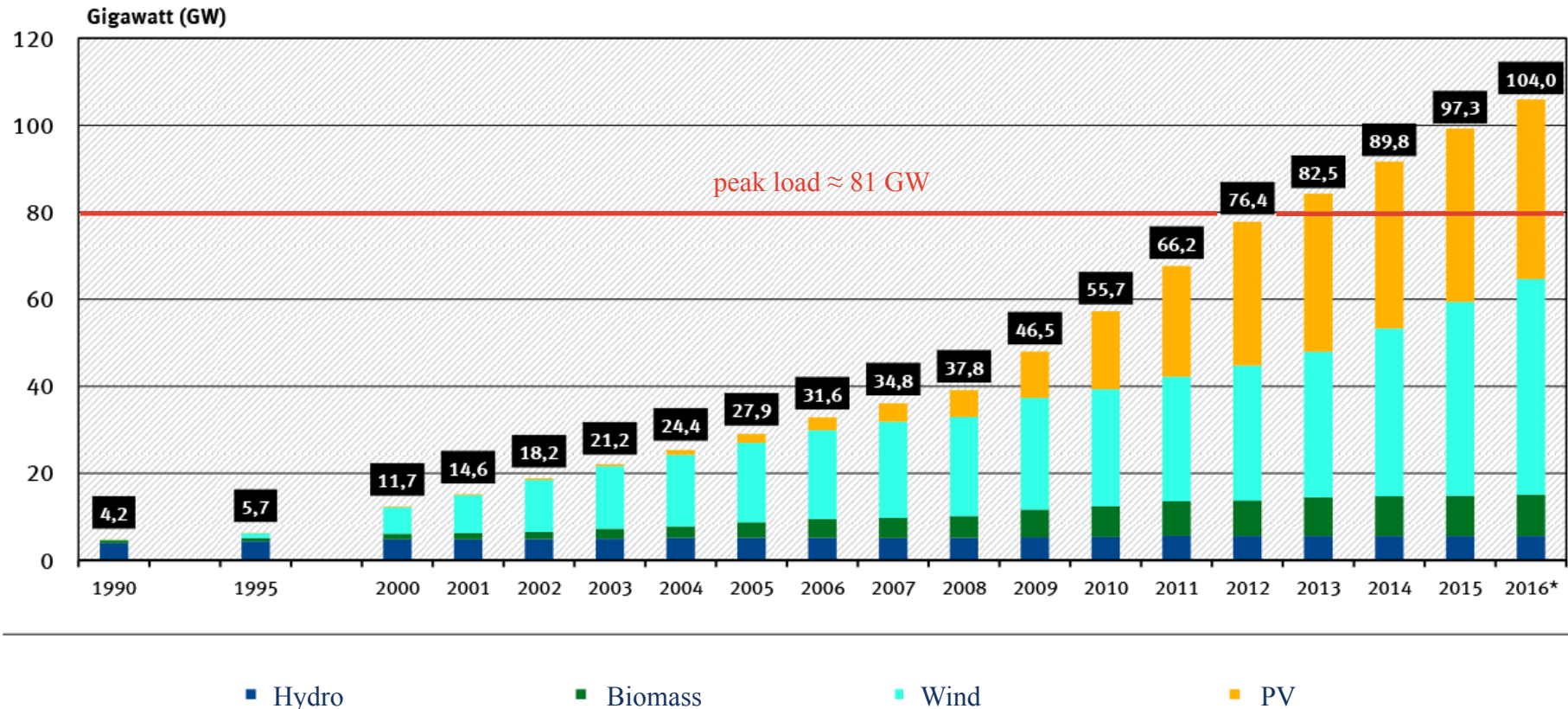


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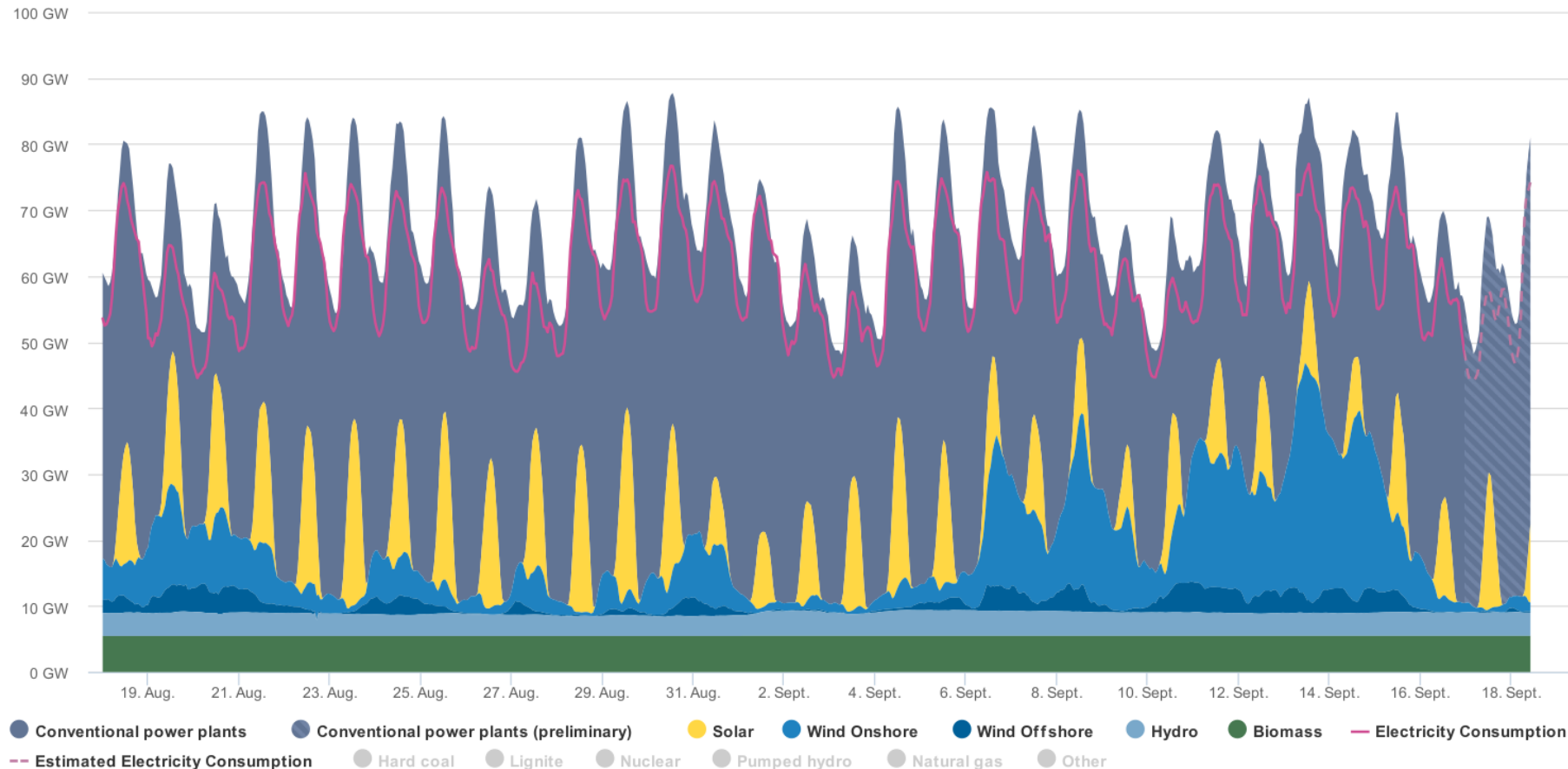
# RENEWABLE CAPACITY EXCEEDS PEAK LOAD ALREADY TODAY BY 20 GW



Quelle: Umweltbundesamt (UBA) auf Basis AGEE-Stat, Stand 02/2017

- In addition: >90 GW of conventional capacity
- New RES capacity in 1st half of 2017: > 3 GW
- RES capacity is projected to double till 2050
- Peak demand will remain rather stable
  - Efficiency compensates for new demand from electric vehicles, air conditioning, heat pumps etc.

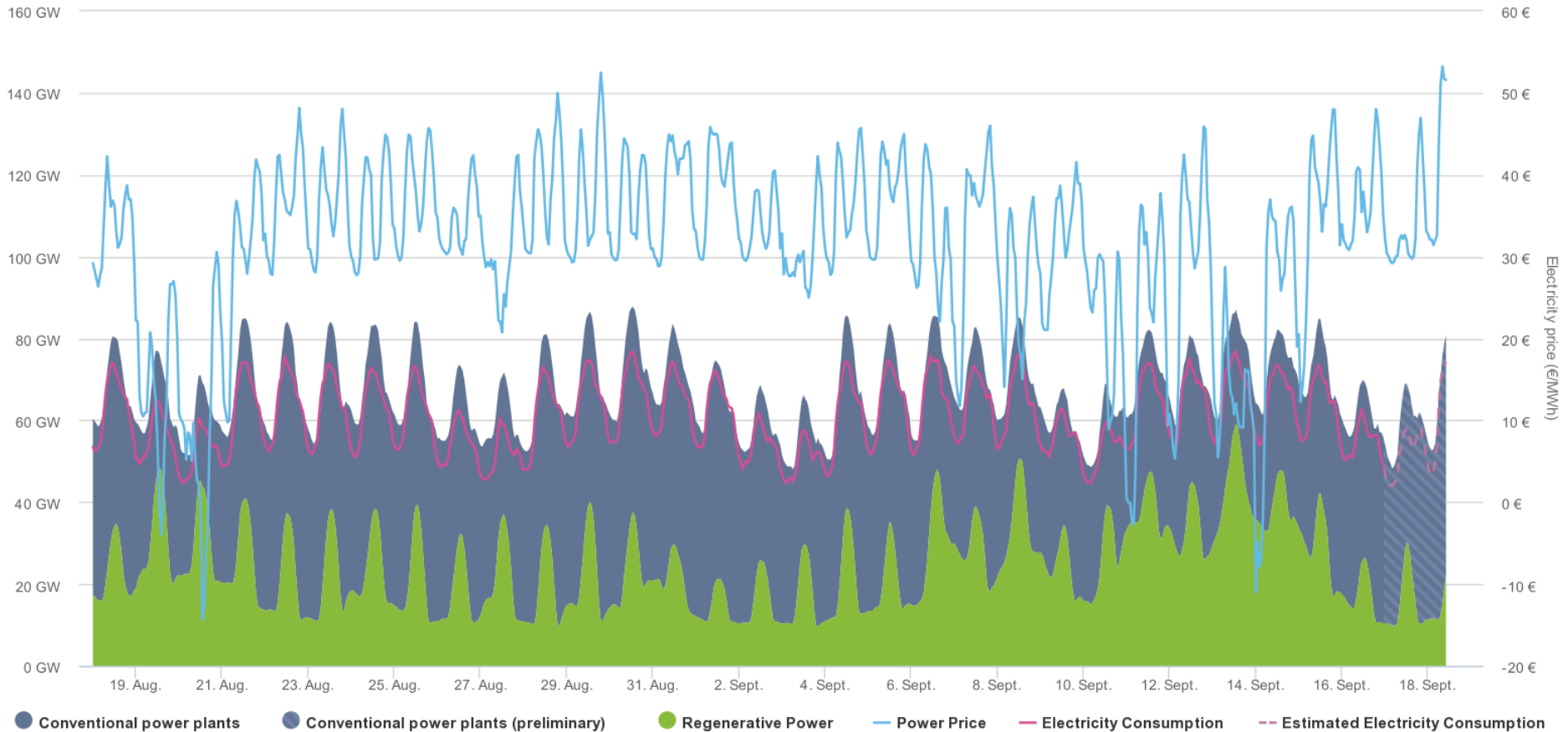
# PV AND WIND PROVIDE LARGE SHARES OF TOTAL DEMAND IN GERMANY – UP TO 75% IN THE LAST WEEKS



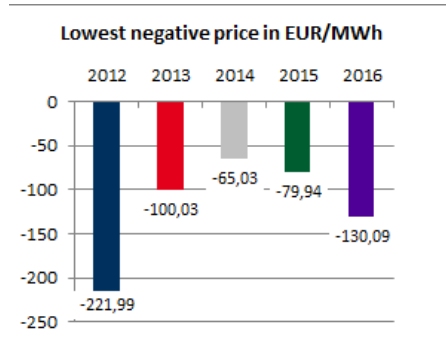
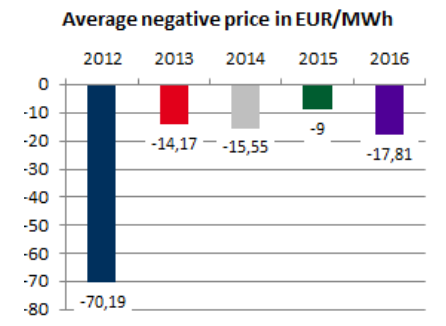
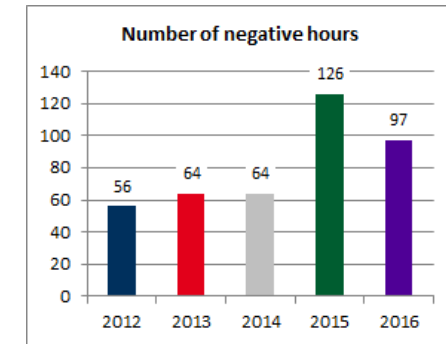
Agora Energiewende; Current to: 18.09.2017, 12:10

- In April renewables provided 88% of total demand for the first time in Germany
- 75% achieved on 14th September
- Highest input from onshore wind and photovoltaics

# NEGATIVE ELECTRICITY PRICES IN SEPTEMBER DUE TO MISSING FLEXIBILITY – PROJECTIONS FOR 2022: 1000H WITH NEGATIVE PRICES IN GERMANY IF WE DON'T INCREASE FLEXIBILITY



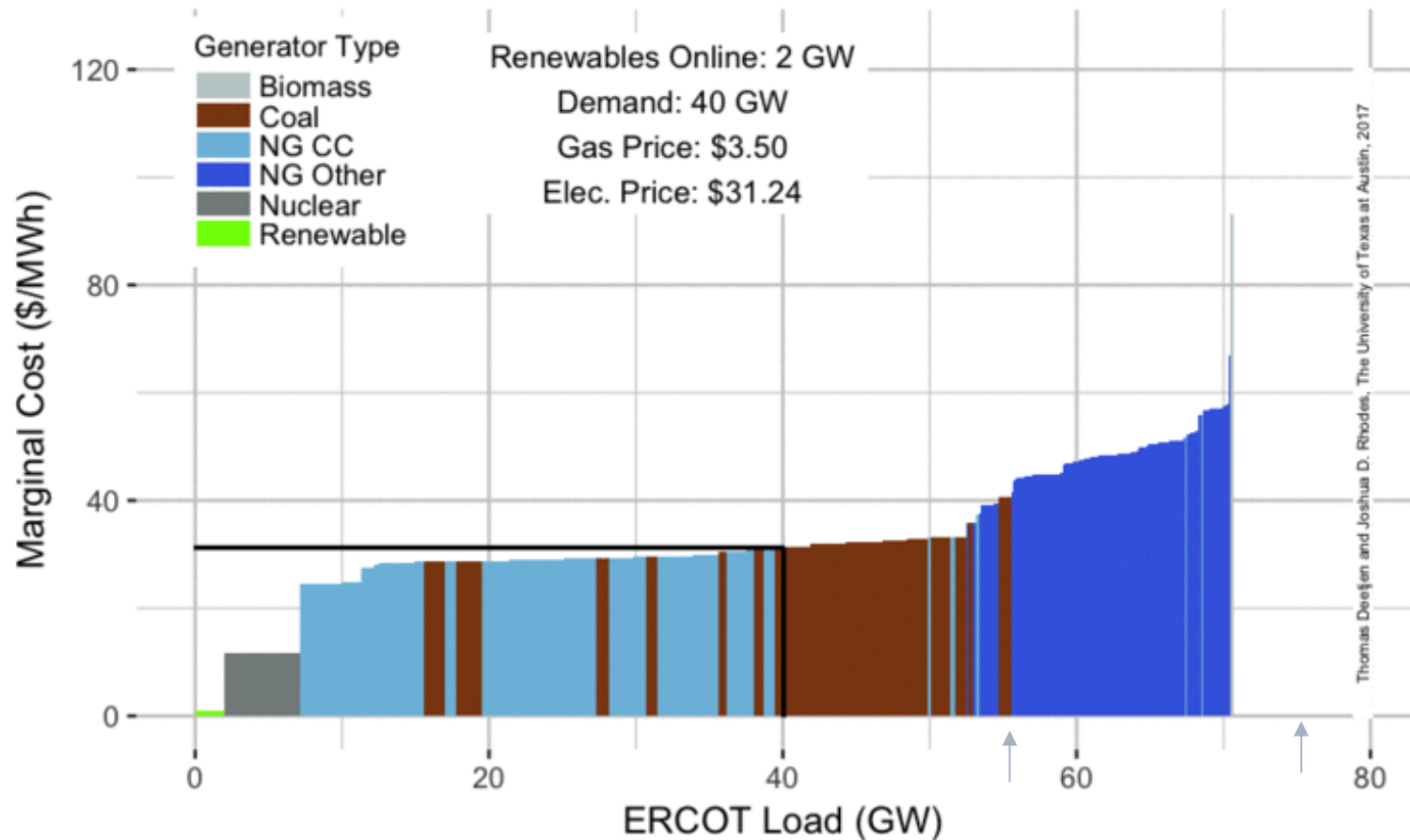
Agora Energiewende; Current to: 18.09.2017, 12:10



Source: EnergyBrainpool, 2017

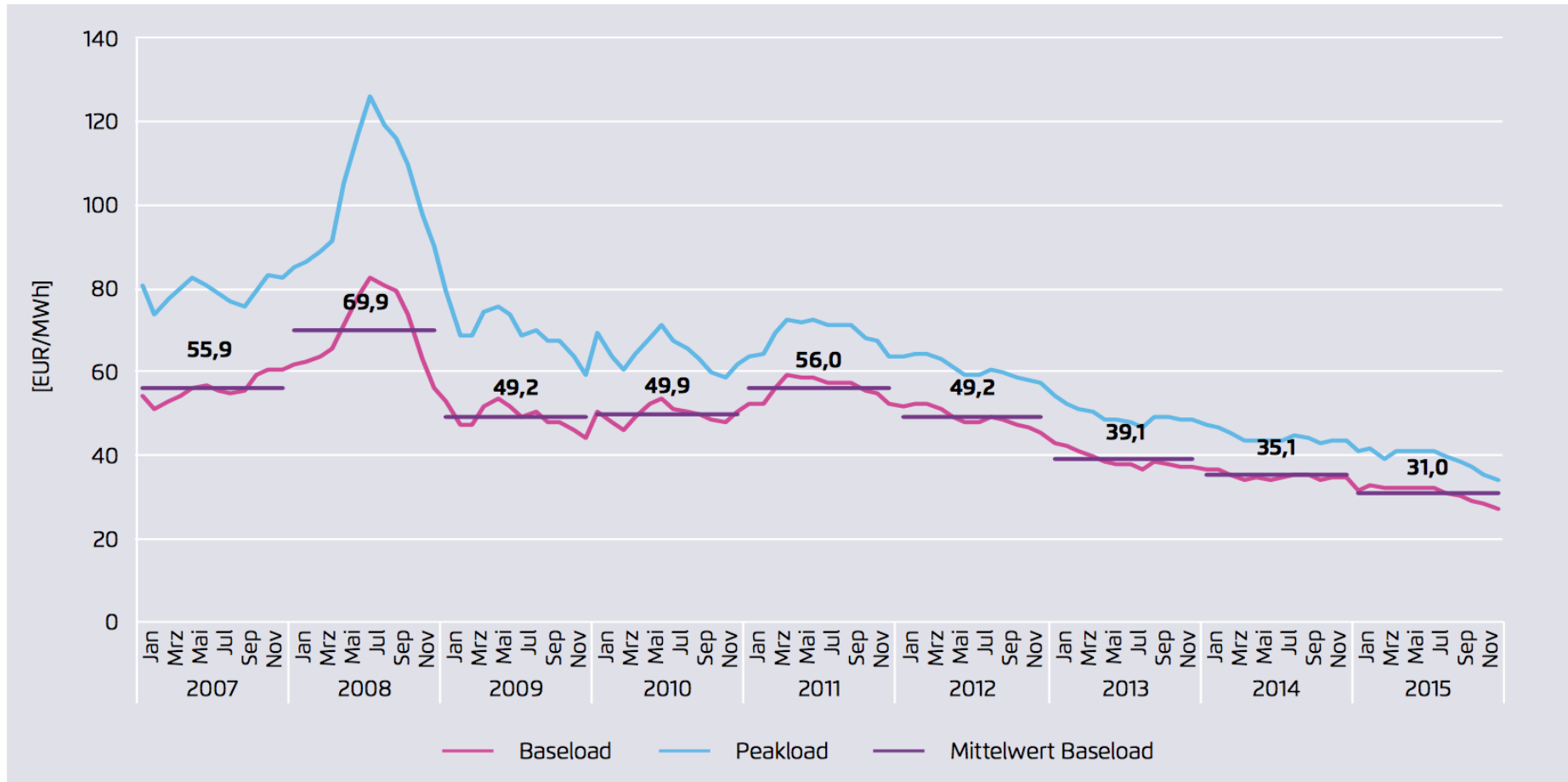


# THE MERIT-ORDER EFFECT – RES DECREASES ELECTRICITY PRICES ON WHOLESALE MARKETS



*An illustration of the electricity market bid stack for the ERCOT grid in Texas. Generators line up left to right from the lowest cost to highest cost every five minutes. As demand changes throughout the day, the 'marginal generator,' or the last power plant called to provide power, sets the price that every plant providing power (left of the vertical black line) is paid. Power plants to the right of the line are not dispatched and thus do not receive payment in an energy-only market. (NG CC = Natural Gas Combined Cycle; NG Other = NG boilers and combustion turbines). University of Texas at Austin, [CC BY](#)*

# MERIT-ORDER EFFECT REDUCED AVERAGE WHOLESALE PRICES IN GERMANY BY 45% FROM 2007

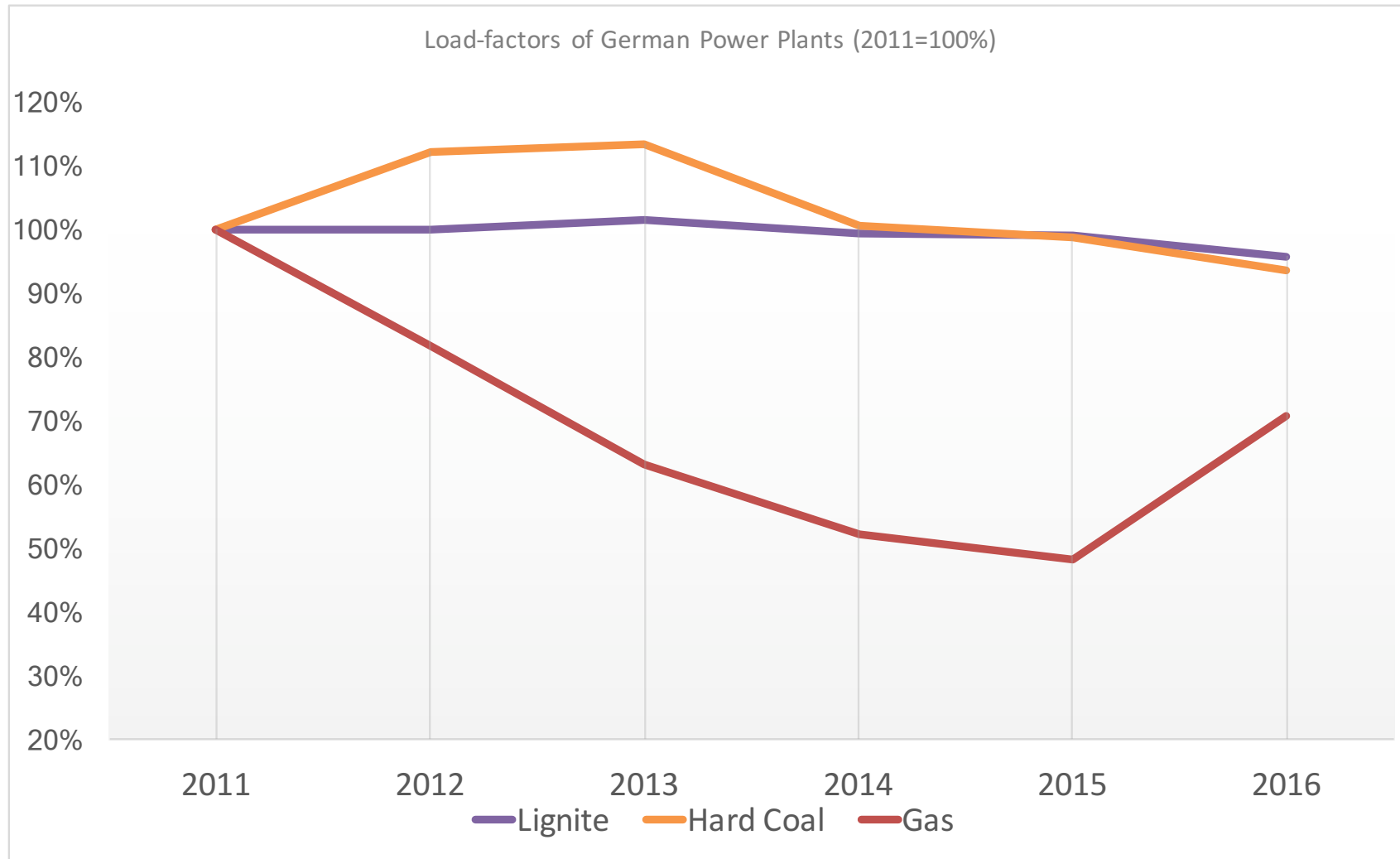


Source: AGORA, 2016

- Estimates for the future wholesale prices vary significantly
- Some expect a moderate increase in whole sale prices till 2030 ,e.g. Energy Brainpool (2013), with a price range of 40-45 €/MWh in 2030
- Other estimate a drastic increase in prices due to changes in the market design, e.g. the Federal Environmental Agency (2013) expects prices above 90€/MWh in 2030
- First indication for 2017: Prices are currently 3-5% higher than 2016



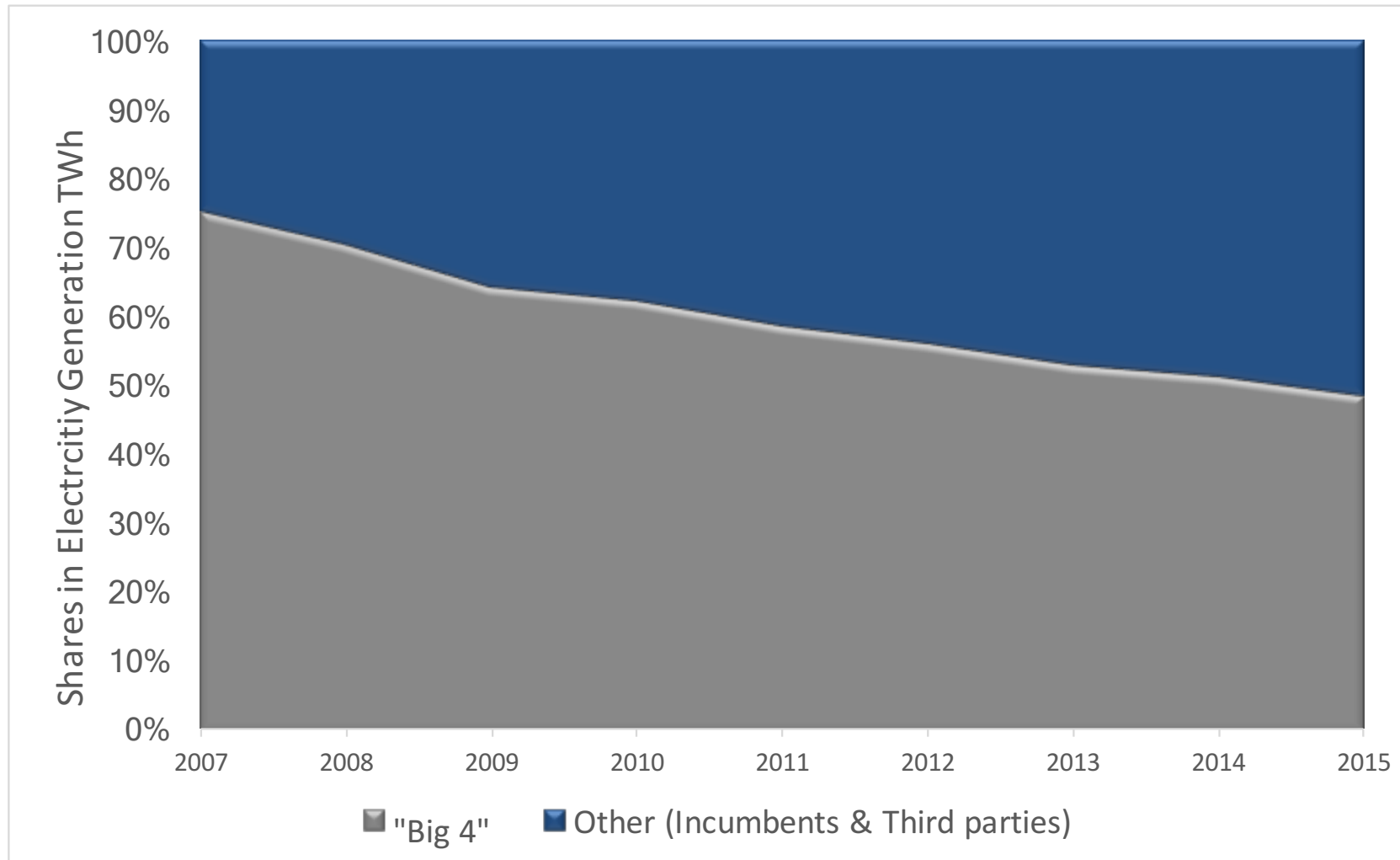
## ESPECIALLY GAS-FIRED POWER PLANTS ARE HIT BY THE MERIT-ORDER EFFECT



Source: own, based on data from [www.energy-charts.de](http://www.energy-charts.de)

- Development of Full Load Hours from 2011 till 2016
- Hard Coal
  - 2011: 3750 h
  - 2016: 3500 h ↓ 7%
- Lignite
  - 2011: 6700
  - 2016: 6450 ↓ 4%
- Gas
  - 2011: 2200
  - 2016: 1550 ↓ 30%

## INCUMBENTS ARE LOOSING MARKET SHARES QUICKLY – FROM NEARLY 90% IN 2000 TO 50% IN 2015

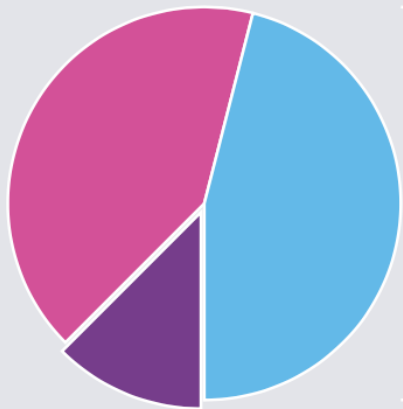


From today's perspective, it was a mistake to completely ignore PV for such a long time!

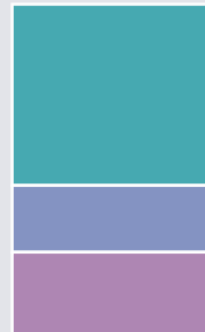
*Peter Terium, CEO RWE, Oktober 2012*

## BIG 4 OWNED 5% OF TOTAL RENEWABLE CAPACITY IN 2012 – CITIZENS ARE PRIMARY INVESTOR IN RENEWABLES IN GERMANY

Institutional and  
strategic investors  
30.2 GW (41.5%)



Citizen-owned  
renewable energy  
projects in broader  
sense  
33.5 GW (46.6%)



Individual owners  
18.3 GW (25%)

Citizen energy  
cooperatives  
6.7 GW (9.2%)

Citizen participation  
(interregional,  
minority shareholders)  
8.4 GW (11.6%)

Citizen-owned  
renewable energy  
projects in a  
narrow sense  
25 GW (34.4%)

trend:research/Leuphana (2013)

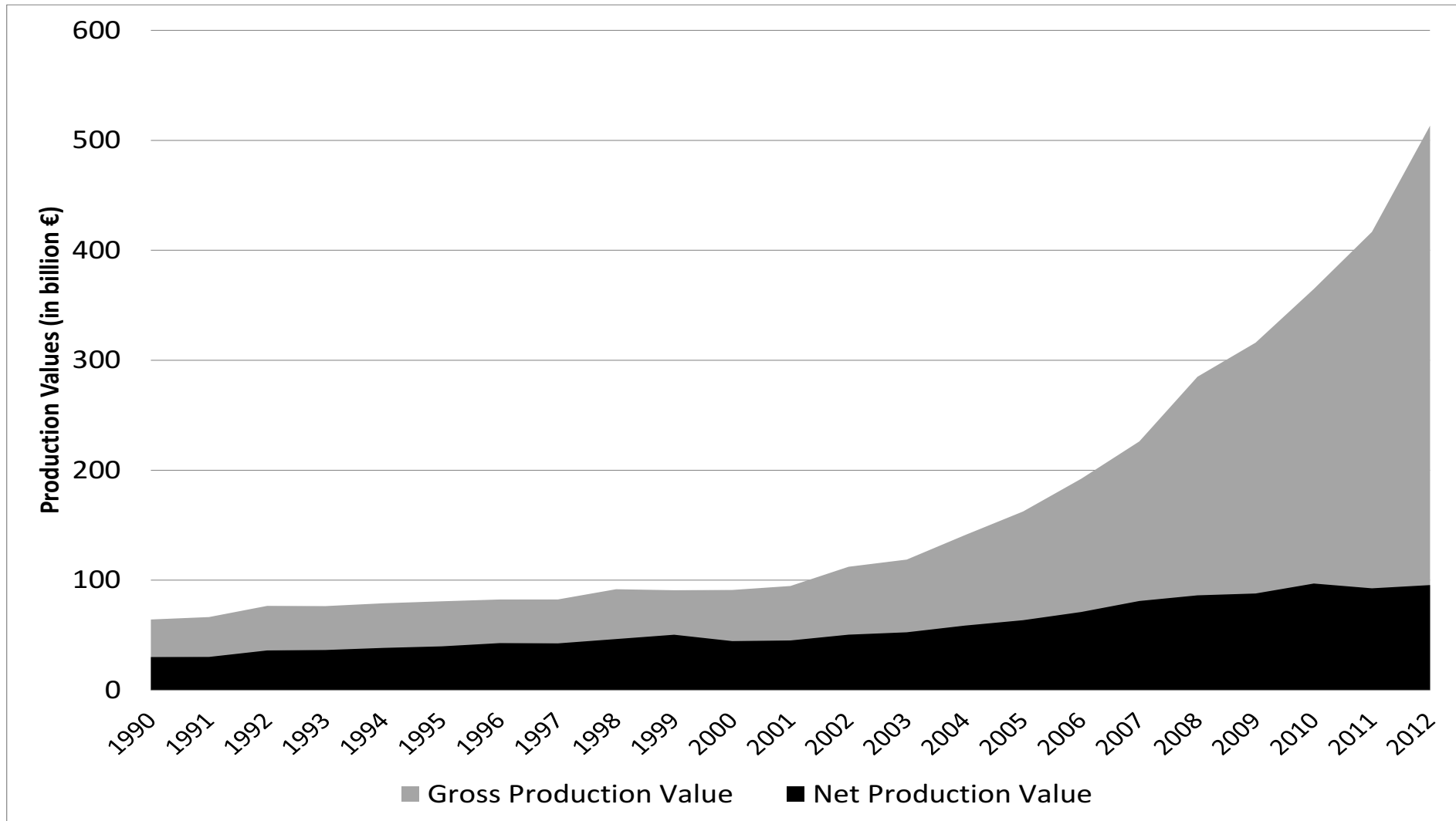
\* not counting pumped storage power plants, offshore wind, geothermal energy, biowaste

Source: Agora (2016)

- Feed-in-tariff set strong incentives for private households to invest
- Now, tendering system rather favours companies
- Still, last onshore tender was 100% won by cooperatives, not utilities
- Project developers are using the cooperatives to use loophole in current tendering process



## THE UTILITIES SHARE IN TOTAL VALUE-ADDED DECREASED SIGNIFICANTLY – ESPECIALLY SINCE THE YEAR 2000



Gross Production Value (GPV):

- total turnover of the sector as a whole

Net Production Value (NPV):

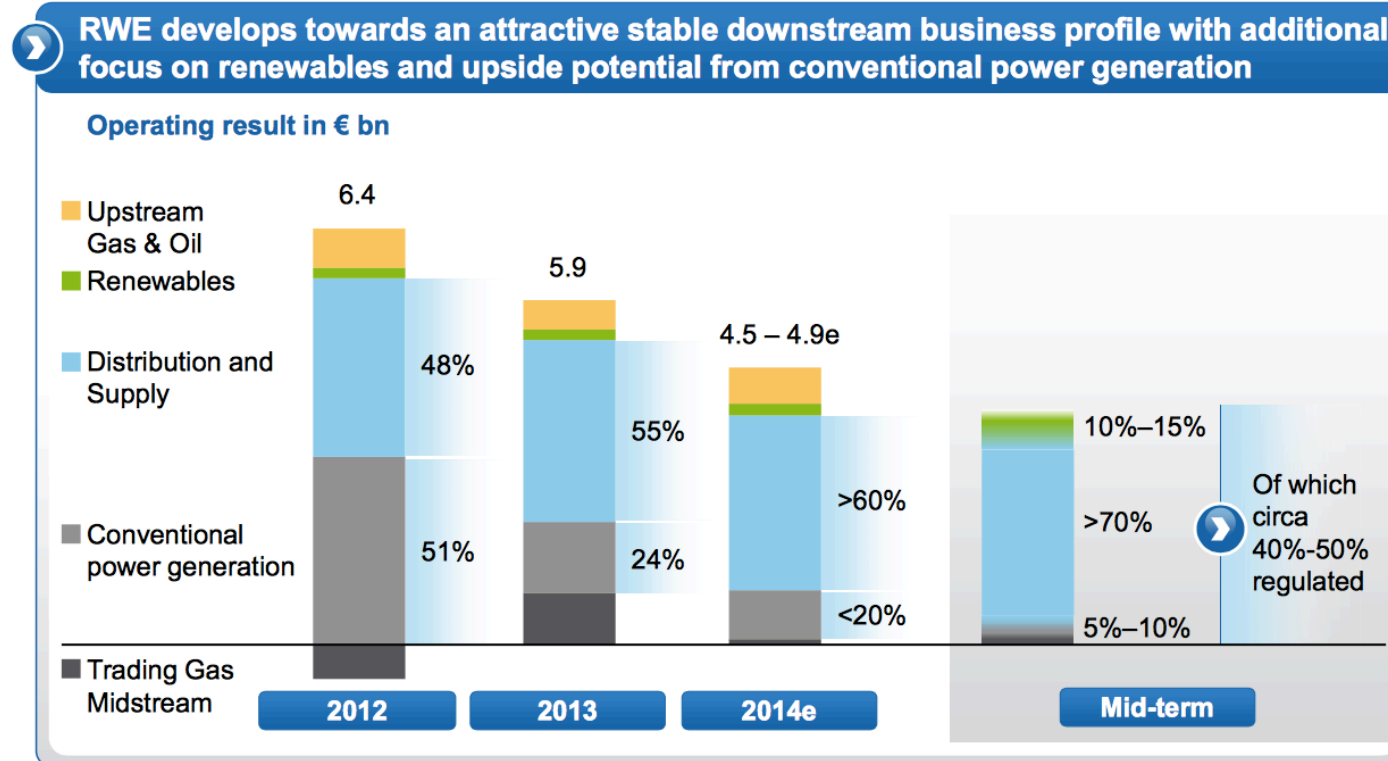
- subtracts “goods and services purchased” (i.e. intermediate input) from GPV.
- main intermediate inputs are the production and sale of wholesale electricity to retail companies (i.e. throughput) and the expenditure for raw materials (coal and gas for electricity generation).

Census added value:

- can be calculated by subtracting all “other” inputs (expenditure for rent etc.) from the net production value

# WHAT'S NEXT?: THE RWE STRATEGY

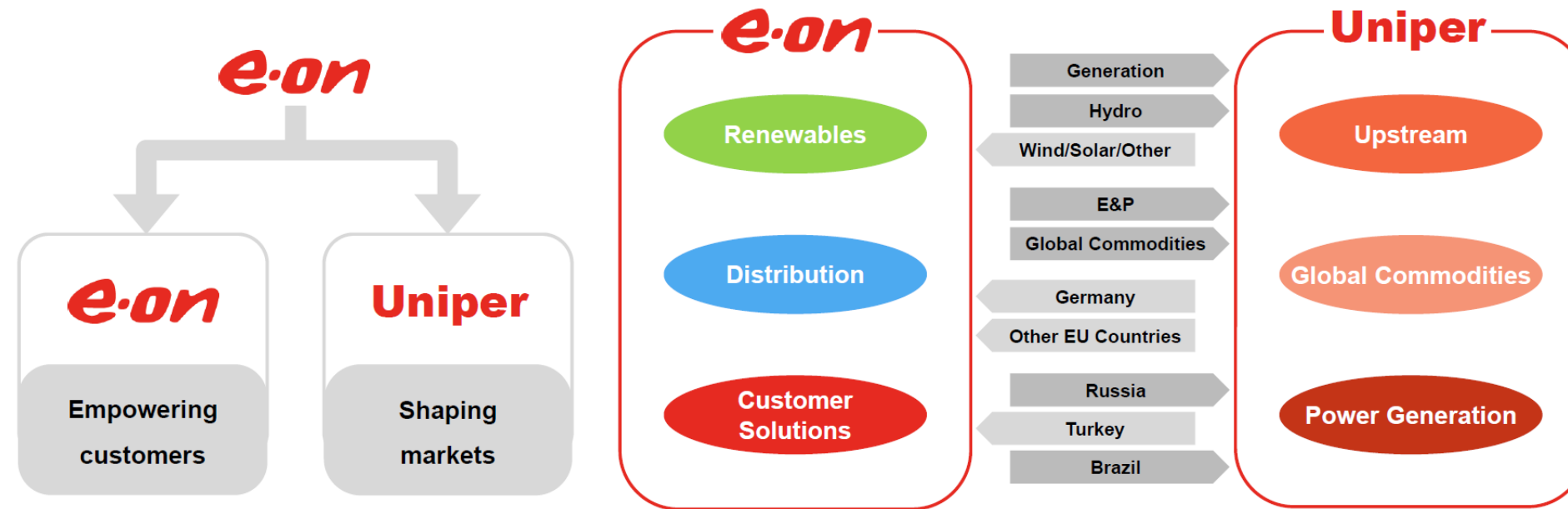
Strategy of RWE – presented in March 2013 by CEO Mr. Terium



Source: RWE (2013)

- With the new company Innogy RWE is moving away from conventional power generation towards distribution networks (smart grids)
- RWE remains a traditional utility with focus on generation

# WHAT'S NEXT?: THE E.ON STRATEGY

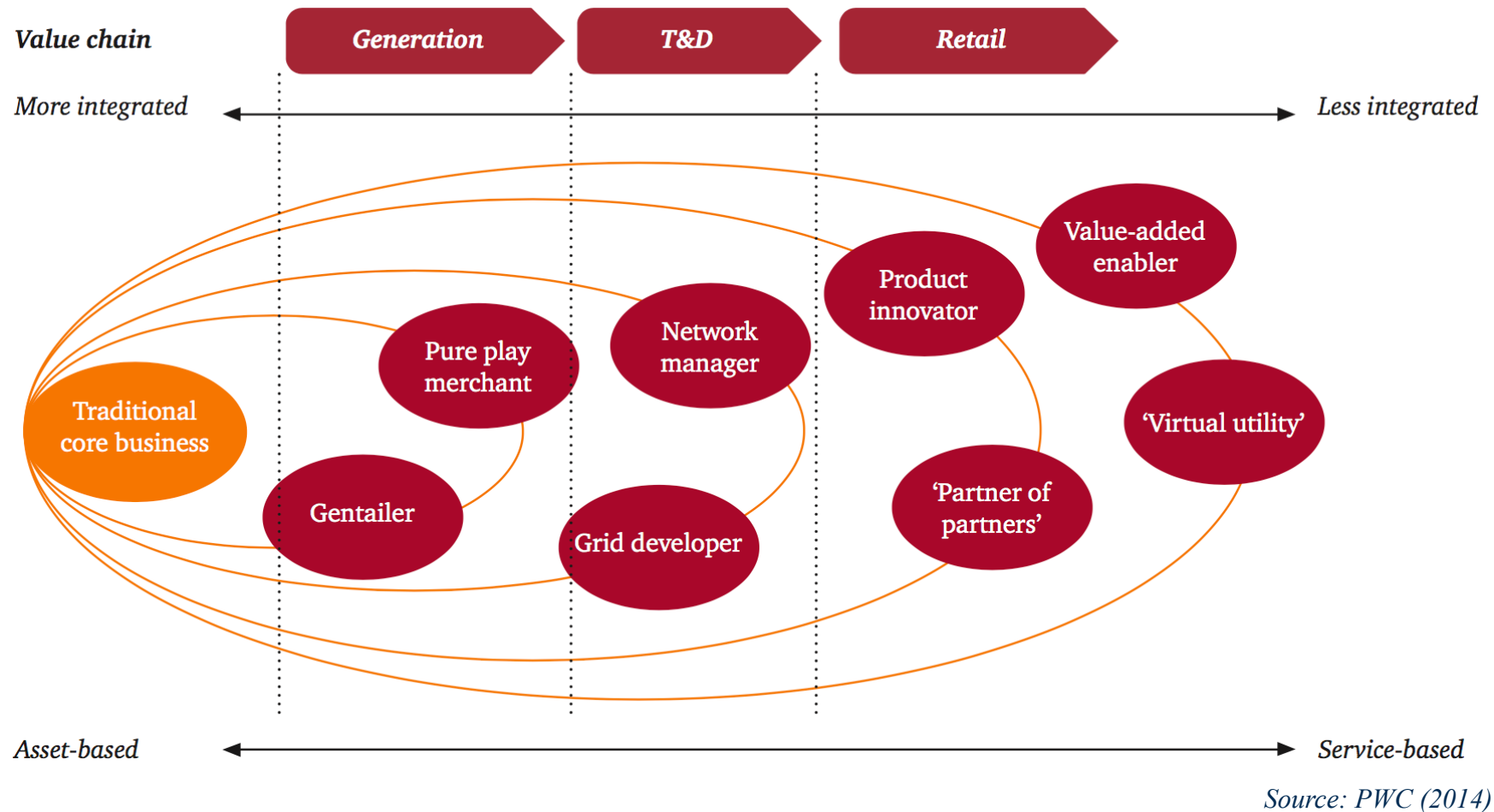


*Source: Eon (2015)*

- E.on has been split into a core company (E.on) and a non-core company (UNIPER)
- UNIPER was brought onto the stock exchange in September 2016
- E.on focuses on the new business areas whereas Uniper becomes a very traditional utility with focus on generation



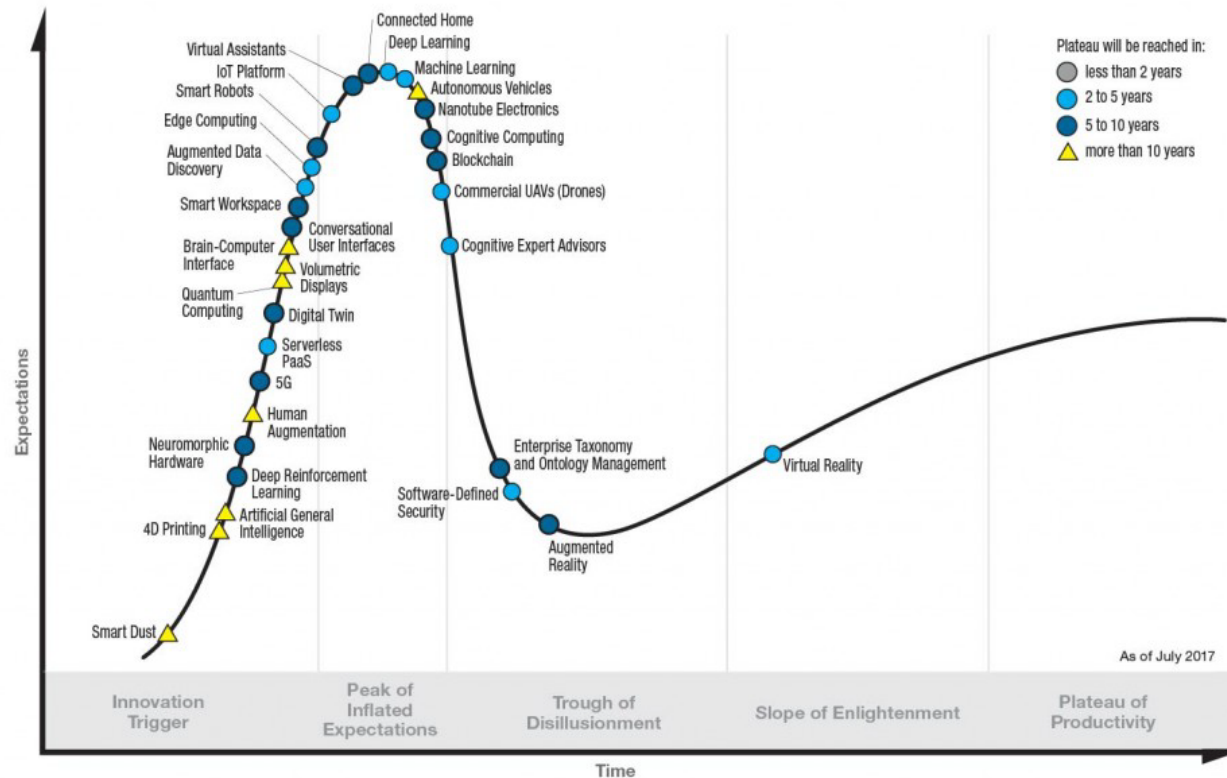
# E.ON & INNOGY ARE BOTH MOVING TOWARDS SERVICE-BASED BUSINESS MODELS



- Both companies on their way to the Product Innovator model?
- Focus their efforts on the consumer and search for new products.
- core business is asset-based, with renewable generation and network assets being large parts of their portfolio. So in this respect, they qualify as “Product Innovators”

# DECENTRALIZATION HAS STARTED AND THE NEXT CHALLENGE FOR UTILITIES LIES AHEAD - DIGITALIZATION

Gartner **Hype Cycle** for Emerging Technologies, 2017



[gartner.com/SmarterWithGartner](https://gartner.com/SmarterWithGartner)

Source: Gartner (July 2017)  
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Gartner.

- IoT platforms are coming in the next years – opening new opportunities for flexibility and ancillary service provision
- Blockchain (P2P) might be ready in 5-10 years with the potential to reduce costs in retail significantly
- Will utilities commit themselves to digitalization or apply again the wait & see strategy?





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**THANK YOU FOR  
YOUR ATTENTION.**

Please feel free to ask questions!



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